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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/798,032	03/11/2004	Zhengming Zhang	2000.129	6000

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EXAMINER
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KALAFUT, STEPHEN J

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 12/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/798,032	ZHANG, ZHENGMING	
	Examiner	Art Unit	
	Stephen J. Kalafut	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☐ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 7 is/are rejected.
- 7) ☒ Claim(s) 3-6 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 February 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |  |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>07 June 2004</u> . | 6) <input type="checkbox"/> Other: ____  |

Art Unit: 1745

Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This claim is confusing because it requires both electrodes to have gas diffusion membranes, while also reciting that the fuel cell is of the direct methanol variety, in which the methanol fuel would be in liquid form.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu *et al.* (US 6,475,249) in view of Takada *et al.* (US 5,460,896).

Hsu *et al.* disclose a fuel cell, such as a direct methanol fuel cell, that comprises a proton conductive membrane (10), catalyst layers (21, 22) on either side thereof, gas diffusions layers (31, 32) juxtaposed to and covering the catalyst layers, and conductive plates (7) including flow fields that cover and communicate with the diffusions layers. In the direct methanol embodiment of the fuel cell, the methanol would react on the catalyst to produce electricity. These claims differ from Hsu *et al.* by reciting that the diffusion layer comprises a microporous membrane and a hydrophobic coating next to the catalyst. Takada *et al.* disclose a solid electrolyte fuel cell that includes a gas diffusion layer (35) made by impregnating porous metal foam with PTFE (column 5, line 64 through column 5, line 11). Since the PTFE coats the foam, this hydrophobic material

Art Unit: 1745

would be in contact with the "electrode core" (34) and thus with the electrode catalyst. The coated foam forms a membrane (column 2, lines 18-21). Because the gas diffusion membrane of Takada *et al.* has a low electrical resistance and allows better diffusion of the gas therein than in a carbon gas diffusion layer (column 2, lines 21-26), it would be obvious to use the gas diffusion membrane of Takada *et al.* in the fuel cell of Hsu *et al.*

Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu *et al.* (US 6,475,249) in view of Morse *et al.* (US 6,960,403).

Hsu *et al.* disclose a fuel cell, such as a direct methanol fuel cell, that comprises a proton conductive membrane (10), catalyst layers (21, 22) on either side thereof, gas diffusions layers (31, 32) juxtaposed to and covering the catalyst layers, and conductive plates (7) including flow fields that cover and communicate with the diffusions layers. In the direct methanol embodiment of the fuel cell, the methanol would react on the catalyst to produce electricity. These claims differ from Hsu *et al.* by reciting that the diffusion layer comprises a microporous membrane, or that both diffusion layers each comprise a thermoplastic microporous membrane. Morse *et al.* disclose a solid electrolyte fuel cell (218) including microporous membranes made of the thermoplastic polymer polyimide, to which the electrodes are attached (column 2, lines 55-60). Because the channels in the polyimide layer are less than 10 microns in size, the membrane would be microporous. The polyimide layers may be used with both electrodes (column 5, lines 18-28). Because these gas diffusion membranes are suitable for polymer electrolyte fuel cells (column 3, lines 10-21), the same type as disclosed by Hsu *et al.*, it would be obvious to use the

Art Unit: 1745

gas diffusion membranes of Morse *et al.* in the fuel cell of Hsu *et al.* Claim 7 is thus rejected over the combination of Morse *et al.* and Hsu *et al.*, to the extent that it is understood.

Claims 3-6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art cited either herein or by applicant does not disclose or teach a DMFC with a microporous gas diffusion membrane that is either asymmetrical or includes a perm-selective layer in addition to the microporous layer.

Claims 3-6 are objected to because of the following informalities: The verbs in the clauses starting with “wherein” should be in the present tense. Specifically, “having” should be “have” and “being” should be “is”. Appropriate correction is required.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sun *et al.* (US 6,248,476) disclose a metal-air cell with an air diffusion membrane. Kim *et al.* (US 6,699,611) disclose a fuel cell with a thermo-responsive polymer that alters the flow rate of incoming gas. Bai *et al.* (US 6,716,549) disclose a fuel cell with a metalized gas diffusion layer. Bostaph *et al.* (US 2003/0031908) disclose a DMFC within a housing (28).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen J. Kalafut whose telephone number is 571-272-1286. The examiner can normally be reached on Mon-Fri 8:00 am-4:30 pm.

Art Unit: 1745

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

sjk

STEPHEN A. J. RYAN  
PRIMARY EXAMINER  
GROUP 1700

